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The study employed 13 kindergarten age boys and girls in examining the relationships between field dependence, body image boundary, and space utilization during locomotor play activity. In addition, scores on all variables were analyzed for sex differences.

Three five minute videocordings, taken during an eight day period, were examined to assess subjects' space utilization. The space used by each subject was calculated as linear feet traveled and square feet circumscribed. Data on field dependence and body image boundary were collected from subjects' scores on individually administered Children's Embedded Figures Tests, Form 1 and the first 25 inkblots of the Holtzman Inkblot Test, Form A.

Spearman Rank Order Correlations were not found to be significant between measures of space utilization, body image boundary, and field dependence.* Olkin's z was calculated to examine the significance of the differences between body image boundary and field dependence predictor variables with linear and square foot predictands. No significant differences were found. The Mann-Whitney U Test was used to assess sex differences. Boys were found to use significantly more square feet of space during locomotor activity.**

* Significance was assessed using a two-tailed .10 level of significance.
** A U of 2 was associated with a probability of .004.

RELATIONSHIPS BETWEEN CHILDREN'S SPACE UTILIZATION, FIELD DEPENDENCE, AND BODY IMAGE BOUNDARY

by

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CHAPTER I

INTRODUCTION

Locomotor activity comprises a considerable part of the multi-faceted framework of human behavior. Like other categories of behavior, locomotor activity is influenced by a complex interaction of factors. The number of factors involved is undoubtedly extensive. Some of these, such as self image, are variables which are considered to be internal to the organism. Others, like visual perception, rely more upon man's immediate external environment.

Knowledge of the character and function of the various behavioral influences may provide man with a greater understanding of his locomotor activity. Although various studies have explored numerous aspects of man's movement and have added to the knowledge of his motor behavior, many concerns are relatively unexplored. Until more in-depth knowledge is accumulated speculation and empirical reasoning must suffice as explanations of the whys surrounding each man's motor behavior. The present study seeks to contribute information to one of the lesser studied dimensions of motor behavior, the child's quantitative utilization of space during locomotor activity.

Statement of the Problem

The purpose of this study is to investigate the relationships between space utilization during locomotor movement and measures of

body image boundary and field dependence in the five year old child. The following hypotheses are tested.

1. Space utilization measurements of the five year old child engaged in self-structured locomotor movement are positively related to measures of field dependence-independence.

2. Space utilization measurements of the five year old child engaged in self-structured locomotor movement are positively related to measures of body image boundary.

3. High body image boundary Barrier scores of the five year old child are positively related to measures of high field independence.

4. Significant sex differences are found in five year old children on measures of body image boundary, field dependence, linear feet of space used during locomotor activity, and square feet of space used during locomotor activity.

In addition to testing the above hypotheses, this investigation is concerned with the characterization of each individual subject's utilization of space.

Definition of Terms

Barrier score is a subject's total number of body image oriented responses involving perception of a "protective, enclosed, decorative, or concealing function" of the periphery of the first

25 inkblots on Form A of the Holtzman Inkblot Test (R. Fisher, 1966, p. 436).

Body image boundary is a psychological concept concerned with an individual's experiencing his body as demarcated from his environment (Fisher & Cleveland, 1958, p. 56).

Cognitive style is a broad construct which includes an "articulated" aspect within which is found the tendency to structure immediate perceptual fields (field independence) and to deal with symbolic material in an analytical fashion. Also included is the tendency to perceive a fused perceptual field (field dependence) and to experience symbolic material as a unified whole. This aspect is termed the "global" component of cognitive style (Witkin, Oltman, Raskin, & Karp, 1971, p. 7).

Field dependence is a construct denoting a mode of perception in which the overall organisation of a perceptual field dominates so that the individual parts of the field are experienced as "fused" (Witkin et al., 1971, p. 4).

Field independence is a construct denoting a mode of perception in which the overall organisation of the perceptual field does not dominate. The parts of the field are experienced as distinct and discrete (Witkin et al., 1971, p. 4).

Locomotor movement is movement which involves transporting the entire body from one place to another, e.g. walk, run, roll.

Motor behavior refers to the observable, voluntary movements of the skeletal musculature (Cratty, 1968, p. 9).

Perception is a term concerned with the meaningfulness attached to objects, events, or situations within an individual's spatial and temporal proximity. It is a dynamic process which involves organizing and selecting the stimuli to which one is exposed (Cratty, 1968, p. 23).

Reactivity is organic response to a stimulus.

Style is a "specific or characteristic manner of expression, execution or design (Webster's New World Dictionary, 1959, p. 1449)."

Assumptions

This study is predicated on several assumptions. First, it is assumed that the five year old child possesses an integrated self which is expressed through modes of behavior. Further, locomotor movement, as a component of motor behavior, is accepted as an overt expression of the integrated self. A third assumption underlying the investigation is the belief that locomotor movement is a component of motor behavior which can be studied independently. Fourth, the study assumes that the external environment exerts an influence on patterns of behavior. Finally, a five minute film analysis is accepted as an adequate index of a subject's space utilization behavior.

Scope of the Study

Several factors set the limits for the present investigation. First, the sample is acknowledged to be too small to permit generalizing beyond the subjects involved. Second, only one environment is employed in the measurement of space utilization. A third limitation is the lack of control exerted over many interacting variables. Further, within the

conduct of the study only single measures of body image boundary and field dependence are used. In addition, bias from sample selection is possible. Finally, only one age group of children is investigated.

Significance of the Study

Much of the child's behavior involves interaction with the environment. One of the early ways in which he interacts with his world is through motor behavior. Because motor activity takes place within a time-space-force framework, knowledge of how and why a child utilizes the space in which he moves would seem to be important considerations for understanding motor behavior. Yet very little is known about the child's utilization of space other than some limited evidence that space utilization during locomotor activity is a stable function of his behavior.

There is also reason to believe that the physical use of space may be related to two other dimensions of behavior which reflect the child's characteristic style of functioning: (1) perception of body boundary definiteness and (2) perception of objects as discrete within a field context. Research yielding data about the relationships between space utilization and these perceptions may enhance our understanding of individual differences in motor behavior. This research also has the potential of contributing important information to that aspect of child development which seeks to understand the function of movement in the maturation process.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter deals with past research which provides background rationale for the present investigation. Information concerning the relationships between space utilization and two additional measures of individual functioning, body image boundary and field dependence, are considered.

Space Utilization

One observable aspect of behavior is locomotor movement. The perception of certain stimuli is assumed to initiate or bring about the observed motor behavior. Though much of this stimulation is visual, nonvisual components of space add to perception (Hochberg, 1964). In relation to the importance of stimuli in our perception Allport (1955) concluded that their action upon us builds our spatial perception "both in their immediate spatial localization on the body and, in a more complicated way," in making us aware of the three dimensional space which surrounds us (p. 86).

Piaget and Inhelder (1948) suggest that the child's conception of space "is not a 'reading' or apprehension of the properties of objects, but from the very beginning, an action performed on them (p.449)." It is through the stimuli derived from the exploration of objects and physical space that the child begins to comprehend the nature of objects,

of space, and of himself (Espenschade & Eckert, 1967). Man not only perceives the space which surrounds him but also utilizes this space in his exploration of the world.

There are indications that the quantitative utilization of space during locomotor movement is a stable aspect of behavior. Three studies involving actual quantifiable locomotor space utilization are reported in the literature (Ahrens, 1966, Herron & Frobish, 1969, and Mulhauser, 1970).

Ahrens (1966) reported space utilization results for sixteen female subjects. Each subject was directed to move about a gymnasium by requesting that each "move as she would like" to recorded music. Subjects were tested individually while a television camera hidden from open view recorded their movements. Space utilization was measured by tracing the subject's movement on a grid superimposed on a television monitor. Scores obtained were concerned with distance moved, number of grid squares utilized, and greatest distance traveled from the starting point. Consistencies in the amount of space utilized were found. Correlation coefficients greater than .8 were obtained when the scores from the three separate trials were compared. Individual differences in space utilization were also reported.

In the second study, Herron and Frobish (1969) were concerned with the development of computer analysis techniques for displaying inter-individual and individual-environment interaction patterns. Records of children's use of space during fifteen minute play periods were generated from data collected by a ceiling mounted camera set to operate at ten second intervals. A Cartesian co-ordinate system was

employed in the analysis to provide data for a computer plotting device which produced graphic representations of movement patterns.

Mulhauser (1970), working with 54 kindergarten age boys and girls, examined individual differences in quantitative space utilization during nonstructured self-initiated locomotor play on an apparatus free playground. After the filming sessions were completed the playground was marked off in ten foot squares and a grid was constructed for measuring space utilization. Linear space utilization measures were compared with data concerned with perceptual-motor development, spatial organization capacity, body size concept, body image, self-drawing, fine motor skill, and open and closed home space. The measures utilized were the Bender Visual-Motor Gestalt Test, a body image size test, a body image concept test, a self-drawing task, and tax records of home dwelling space. Correlation coefficients were not found to be significant between space utilization and body image, body size, home space, or capacity for spatial organization. Linear space utilization was significantly correlated with visual-motor development, fine motor skill, and graphic space utilization.

Space utilization was analyzed by Mulhauser (1970) by calculating the total distance traveled in linear feet and the total area used in square feet. No significant difference was found between trials for mean scores of total distance traveled in linear feet. This finding suggested consistency in space utilization for the group. A significant sex difference in the amount of space used in linear feet was found however. Boys utilized more space than girls. The score distribution of linear feet traveled showed 24 subjects above the mean and 26 subjects

below the mean with 34 (68%) within plus and minus one standard deviation. A similar distribution was found for square feet of space utilised. This supported Mulhauser's contention that actual utilization of space was being measured rather than a general level of activity. Mulhauser concluded that "investigation of the data indicate that some children use large amounts of space and that others use smaller amounts (p. 45)."

A more comprehensive look at space utilisation appears to be warranted from the results of the three studies cited above. Cratty (1968) suggests the importance of additional investigations in which the influence of multiple variables affecting space utilisation could be explored. Among the variables he lists are aspects of personality. Mulhauser (1970) dealt with several components of the personality structure. He assessed body image by the subject's selection of one of ten size gradated cutout figures. Body image size assessment was conducted by furnishing various sized body parts which each subject put together to form a complete figure. The testing procedures used by Mulhauser are among the many available for assessing various body image components. A conclusive statement concerning the relationship between space utilization and body image would not seem possible with this limited testing. Additional aspects of body image such as body image boundary and different measuring instruments must be employed to study the relationship between body image and space utilisation. With this added information a more reliable assessment can be made.

Body Image Boundary

Much of man's behavior involves interaction with objects of the physical world. One of the objects within the environment with which the interaction occurs is the individual's own body. Man utilizes his body as a tool in the socialization process and as an object which is both a recipient and an initiator of action. Many facets of the body's object quality have been focused on what has been termed the "body image." Fisher defines "body image" as the attitudinal framework which designates "the individual's long-term concept of his body and also influences his perception of it (S. Fisher, 1963, p. 62)."

Aspects of body image which have been studied include body size concept, body spatial image, body anxiety, body dissatisfaction, preferred body proportions, right and left discrimination, and body image boundary. The last aspect, body image boundary, has been the focus of increased research during the past fifteen years. Some of the first research was produced by S. Fisher and Cleveland in the identification of body image boundary as a cluster of factors correlated with perceived definite location of the body's boundary in relation to the environment.

The tool employed by S. Fisher and Cleveland to measure body image boundary was the Rorschach inkblot test. Body image boundary was assessed by the degree to which "definite structure, substance, and surface qualities were assigned to the periphery of ink blot images (S. Fisher, 1963, p. 62)." The criteria which are employed in scoring inkblot responses as body boundary oriented involve seeing

the periphery of inkblot responses as connoting a "protective, enclosed, decorative, or concealing function (S. Fisher, 1959, p. 56)." The total number of body boundary responses on the Rorschach projective technique comprises an individual's Barrier score. The Barrier score represents an evaluation of an individual's conception of his body as "definite and firm as contrasted to indefinite and weak (R. Fisher, 1966, p. 436)."

Testing procedures employed to assess body image boundary include figure-drawing tests, word association tests, multiple choice tests, and self-rating techniques. The most fruitful methods of appraising body image boundary involve the projective techniques of the Rorschach test and the Holtzman Inkblot Test (HIT). Both tests have been used with satisfactory results although the HIT may be the preferred instrument due to its standard number of responses. Responses on the HIT are limited to one for each of the 45 inkblots while the Rorschach is often used with varying numbers of responses per blot. Because the total number of responses can influence the size of the Barrier score, this is an important distinction (Swarts & Witzke, 1970).

The assessment of body image boundary, like other psychological measures, is open to criticism concerning reliability and validity. Interscorer reliability on Barrier scoring has been found to be .82 to .97 with most reliability measures falling into the high 80's and low 90's (S. Fisher, 1963). Further research has found that the Barrier score has satisfactory test-retest reliability (S. Fisher, 1970). Much more controversy has occurred in relation to the validity of the body image concept and the Barrier score. At times, researchers have

viewed boundary scores as indicators of cognitive or perceptual operations rather than derivatives of actual body experiences. To these critics, the Barrier score's relationship to other measures is derived from a perceptual framework rather than a body construct. S. Fisher (1963) supports the body construct interpretation of body image boundary:

> No dependable relationships have been found between the boundary scores and indices which might be considered to have cognitive or "perceptual style" connotations. The boundary scores are not consistently related to such variables as intelligence, verbal productivity, the Barron simplicity-complexity dimensions, Gottschalt figure judgments, conventional individual Rorschach determinants, speed of figure-ground alternation, rigidity or authoritarianism (p. 73).

Witkin disagrees with this statement and views the body image boundary construct as related to measures of cognitive style (Witkin et al., 1971). In Witkin's opinion both an articulated body image boundary and an articulated cognitive style are indicators of greater psychological differentiation in cognitive experience.

Increased body image boundary research has made it less difficult to support boundary score criteria and to validate the Barrier score's body image boundary properties. Fisher lists a series of supportative findings which contribute to the validity of the concept. First, boundary response scores have proven to be meaningfully related to an individual's level of anxiety concerning his body. An individual's Barrier score does not, however, correlate well with measures of general anxiety not specifically related to the body (S. Fisher, 1963). Second, boundary scores predict differentiated reactivity patterns of external versus internal regions of the body. Whether Barrier scores are viewed

as reflections of differential activation levels or as actual influencing factors makes little difference. In either case a significant correlation exists between one's external and internal body reactivity and one's attainment of a high or low Barrier score (S. Fisher, 1963).

A third area of verification was uncovered by Fisher and Renik (1966). These researchers found that subjects who focused attention on the boundary regions of their bodies significantly increased their Barrier scores while subjects who directed attention to the internal body regions showed a tendency to decrease their Barrier scores. The decrease was not significantly different from the slight increase in Barrier scores witnessed in the control group. S. Fisher (1970) reported a second study which supported these results. The altering of Barrier scores by manipulation of subjects' bodily attentions supported Barrier scores as true indices of exterior versus interior body experience.

A further generalization which supported the validity of Barrier scores and the body image boundary concept was the correlation of Barrier scores with other body phenomena. In brief, Fisher stated: "They predict various levels of body behavior in the way that a body image measure would be expected to do (S. Fisher, 1963, p. 72)."

In 1970 a series of research studies were reported which were based on the assumption that Barrier scores predicated on real body experience should be accompanied by body sensations analogous to boundary definiteness (S. Fisher, 1970). In the first study a total of 115 undergraduate psychology students were divided into two groups and tested for body image boundary. Subjects were also asked to make observations of prominent sensations in their skin, stomachs, muscles, and hearts

while in a relaxed state. The median Barrier score for both groups was six. A sum was derived from skin responses and muscle responses to indicate the amount of external sensation experienced by each subject while stomach and heart sensation scores comprised an interior score. The median difference between exterior versus interior scores was found to be four, with the exterior score greater in both groups. A rank order correlation between Barrier scores and exterior minus interior sensation scores was found to be significant. The study concluded that "one can say with confidence that there is a positive relationship between the Barrier score and the tendency for exterior body sensations to predominate over interior sensations (S. Fisher, 1970, P. 170)."

The second study in the series used a similar research format but assessed sensations through a retrospective appraisal of past body reactivity during various situations. Two groups comprised of 99 college students responded to lists of 30 situations by recalling the last time they had experienced similar circumstances. Significant correlations between Barrier scores and exterior minus interior sensation recall scores were found in one of the groups but not the other (S. Fisher, 1970).

A third study was carried out based on the following premise: "If selective perception of one's own body chronically occurs, there should be a corresponding selectivity in one's immediate recall of verbal material consisting of references to exterior and interior body sensations (S. Fisher, 1970, p. 173)." Two groups of undergraduate students viewed lists of phrases consisting of items from four clusters: skin items, muscle items, stomach items, and heart items. After

studying a list for one minute each subject was allowed a five minute recall period during which he wrote as many items as possible from memory. Highly significant rank order correlations were found for both groups. The high Barrier subjects recalled a proportionately greater number of exterior body sensations than did low Barrier scorers (S. Fisher, 1970, p. 174).

Other research endeavors have also dealt with the body image boundary concept. Notable among these are inquiries into the self-steering behavior of high and low Barrier individuals. Several significant differences have been found between the two Barrier score groups. In 1958 S. Fisher and Cleveland presented research findings which suggested that individuals with greater boundary definiteness set higher goals for themselves and were more achievement oriented (S. Fisher & Cleveland, 1958). More recent studies by R. Fisher (1966), Hawkins & Horowitz (1971), and Shipman (1965) have supported these conclusions.

Aggressiveness is another characteristic which S. Fisher and Cleveland associate with the high Barrier subject (S. Fisher & Cleveland, 1958). This characteristic has been detected from research involving "normal" subjects. The utilization of maladjusted subjects such as juvenile delinquents in studies of aggressiveness has uncovered a somewhat different picture (R. Fisher, 1966a & Magargee, 1965).

High boundary definiteness has also been correlated with other self-steering characteristics. High Barrier subjects have been found to be: (1) less suggestible, (2) more capable of expressing anger

outwardly, (3) better able to adjust to stress, (4) more self-expressive, (5) more independent, and (6) more capable of self-gratification (Fisher & Cleveland, 1958).

Differences in group behavior characteristics have been noted for high and low Barrier groups. The life styles of high Barrier scorers, though achievement oriented and assertive, involve high regard and concern for others. In comparisons of low and high body image boundary groups Fisher and Cleveland (1958) found "the atmosphere in the latter groups may be characterized as being more democratic, spontaneous, and lively than in the low Barrier groups (p. 211)." More recent findings agree with the statement (S. Fisher, 1970).

Correlations between interior versus exterior body psychosomatic symptoms have been noted in the research literature. One of the several studies which have dealt with this area was reported by Fisher and Cleveland in Body Image and Personality (1958). An interior symptom group composed of subjects with stomach disturbances and ulcerative colitis was given the Rorschach test. The test results were scored for Barrier and the mean score from the interior symptom group was compared to the mean score from an exterior symptom group composed of subjects with rheumatoid arthritis, neurodermatitis, and conversion hysteria. A significantly greater mean Barrier score was found for the exterior symptom group. An earlier study by the same researchers, concerned with the site of body symptoms in 87 undergraduate college students, found that high Barrier subjects reported a significantly greater number of bodily symptoms involving the skin and musculature (Fisher & Cleveland, 1958).

A third study conducted by Fisher and Cleveland found that the Barrier scores of rheumatoid arthritics exceeded the scores of ulcer patients at the .001 level. Further, the researchers found low internal reactivity (as measured by heart rate) in low Barrier scorers and higher external reactivity (as measured by galvanic skin response) in arthritic patients (S. Fisher & Cleveland, 1960). In addition to the three studies cited, investigations by Cleveland, Snyder, and Williams (1965) and Shultz (1966) revealed similar results. S. Fisher (1970) noted that not all studies agreed with these findings however. Since many variables interact to determine the site of a disorder, S. Fisher stated that measuring any one variable can account for only a small part of the determining variance (S. Fisher, 1970, p. 218).

The reactivity findings related to site of bodily symptoms are associated with a second area of study dealing with general stress reactivity. Subjects with well-defined body image boundaries display greater stress reactivity on exterior body measures. Conversely, low Barrier subjects display greater reactivity on interior body measures. The indices which were employed to determine internal reactivity included blood pressure, pulse rate, stroke volume, and cardiac output. Measures of external physiological reactivity included the electromyogram, galvanic skin response, and peripheral resistance of the cardiovascular system (Davis, 1960).

These findings suggest that the person with greater boundary definiteness is more "motivated in the direction of voluntary control of the environment than is the indefinite-boundary person (S. Fisher & Cleveland, 1958, p. 312)." High Barrier subjects have been reported

to experience more emphasis of body sensation in the striated musculature. A theoretical explanation offered for this is the high state of activation potential in the voluntary musculature of the high Barrier subject. A significantly higher degree of muscle tension has been observed in the high Barrier subject. It is postulated that the difference may be caused by a greater amount of proprioceptive feedback in the high Barrier subject (Fisher & Cleveland, 1958, p. 341).

Sex differences have been identified in research involving Barrier scores, although a relationship between Barrier scores and degree of masculinity-femininity has not been reliably established. Fisher and Cleveland (1958) noted sex differences in children at age levels where anxiety or confusion over life goals was found but no sex differences in middle class American adults. A later study by S. Fisher (1970) with 274 college age males and 290 college age females found lower Barrier scores for males. The finding agreed with other studies conducted by Jacobson (1965) and Hartley (1964). Similar sex differences have been found with younger subjects. Morton (1965) obtained significant sex differences with 12, 13, and 14-year-old age groups. Gordon, utilising 360 normal children ages 6, 9, and 12, found that girls at these ages had higher Barrier scores (Gordon, 1965). Woods (1967) found similar results with 8, 10, and 12-year-old age groups.

Age differences were reflected in Barrier scores on a cross-sectional study of subjects ages 8 to 20 (McFee, 1971). The Barrier score increased across the entire age range. The increase might be expected due to the greater environmental experience and clarification of life goals demonstrated by the oldest age group. One might logically

deduce from this that a relatively stable Barrier score should exist during the adult years. In 1959 S. Fisher (1959) studied the body image boundaries of 40 adult subjects from 58 to 90 years of age in comparison to the boundary scores of controls from the subjects' families. The study supported the use of body image boundary as a long term personality attribute rather than a transient state.

The differences found in physiological reactivity, muscular activation, and steering behavior suggest the possibility that significant differences between high and low Barrier scorers might also be found in general motor behavior characteristics and, more specifically, in physical skill performance. Several studies dealing with body image boundary and performance on selected motor tasks have been completed. One study by Woods, in 1967, and two others by McFee, in 1968 and 1971, investigated the relationship between body image boundary and performance on selected gross motor tasks. Woods utilized 143 subjects ages 8, 10, and 12. Barrier scores were assessed from the first 25 inkblots of the Holtsman Inkblot series. The scores were compared with subjects' performances on the shuttle run, basketball catch-throw, and target jump. Woods (1967) suggested the following theoretical relationship might be found between movement performance and body image:

> Since a well-articulated body image has been posited as being necessary to coherent movement and movement as necessary to build the image, it is conceivable these two dimensions of the total personality might be either separate indicators of differentiation or one might influence and be reflected by the other (p. 20).

The only significant correlation found between motor tasks and

Barrier scores in Woods' study was for ten year old male subjects. Significant at the .10 level was the relationship between the subjects' Barrier scores and their performances on a shuttle run task. Using analysis of variance techniques, Woods found the Barrier score did not contribute significantly to the source of variance in performance on the gross motor tasks. However, the fact that both of these areas showed evidence of developmental differentiation led her to suggest that a reciprocity function of mutual dependency might have existed (Woods, 1967, pp. 161-162).

The study reported by McFee in 1968 was a partial cross-sectional extension of the earlier study by Woods. The investigation employed 38 subjects ages 18 and 20. In addition to the motor tasks used by Woods, a three item battery taken from the five item Scott-French Motor Ability Battery was used. The three test items were the obstacle run, basketball throw for distance, and the standing broad jump. In general, Barrier scores were found to be inversely related to poor motor skill performance. No significant relationships between Barrier scores and motor tasks were found for the twenty male subjects employed in the study. The eighteen female subjects were found to have significant relationships between their Barrier scores and (1) the shuttle run at the .05 level, (2) the obstacle race at the .05 level, and (3) the basketball throw at the .10 level (a negative correlation of .405). The study supported the indication that a mutual interdependency existed between performance on selected motor tasks and definiteness of body image boundary.

A cross-sectional study for ages 8 through 20 was reported by

McFee in 1971. The developmental trends found were: (1) Barrier score increased with age and (2) motor performance improved with increased differences in sex characteristics. It was found that, when total motor performance was considered, significant correlations between performance and body image were found for males of ages 10, 18, and 20 and females of age 18. McFee arrived at a conclusion similar to that of Woods. McFee (1971) stated:

> One can project that to a certain minimum degree a differentiated, firm body image enables the individual to better manipulate his body in space, or conversely, that ability to move in a coordinated articulated manner contributes to a well-defined body image (p. 3).

Lampen (1972) investigated the effects of selected movement experiences on body image boundary. The study employed a pre-test design with 18 five year old subjects randomly assigned to control and experimental groups. Both groups participated in perceptual-motor experiences during a twenty week training period. The experimental group received instructions which emphasized body dimensions through the use of the words wide, narrow, long, and short. Barrier scores were assessed from slide presentations of the first 25 inkblots of the HIT. The control group had a pre-test mean of 5.333 and a post-test mean of 5.667. The differences between control and experimental groups' Barrier scores were not found to be significant on either the pre-test or the post-test.

S. Fisher (1970) added focus to the influence of body image boundary on motor behavior. He posited that the definiteness of body image boundary affected many aspects of life including perception

of the external world and the force with which the individual dealt with persons and objects. In summary S. Fisher stated: "there are few levels of experience and overt behavior that are not at least tangentially influenced by boundary conditions (S. Fisher, 1970, p. 308). It is logical therefore that a positive relationship between body image boundary and space utilization should be theorised to exist.

Field Dependence

A field dependent style of perceiving is found when the overall perceptual field is the dominating factor in perception. A field independent perceptual mode or analytical style of functioning is present when parts of the field are perceived as separate and discrete (Witkin, 1967). Initially, field dependence was linked only to visual perception. Later the construct was associated with various measures of intellectual activity and became one aspect of a larger global-articulated dimension of personality. Finally the global-articulated dimension was linked with self-consistency across several areas of cognitive and perceptual functioning which included body concept, self concept, and controls and defenses (Witkin *et al.*, 1971). This more inclusive construct was called "differentiation." As was noted previously, a conflict of ideas and definitions occurred when one looked at measures of what Fisher and Witkin each designated as body image.

The measurement of field dependence utilized a variety of testing devices which involved an assessment of the ability to disembed, to separate parts from their field contexts. Three tools were used extensively in past research: (1) a rod and frame device, (2) a body

adjustment test, and (3) an embedded figures test. In the rod and frame test (RFT) the subject, seated in a darkened room, adjusts a tilted luminous rod to a vertical position within a tilted luminous frame. The body adjustment test (BAT) involves the subject's adjusting his own body to an upright position. The individual, seated in a tilted chair, attempts to bring himself and the chair to an upright position within the context of a tilted room.

In the embedded figures test (EFT) the subject's task is to find a previously seen simple figure embedded within a large complex design. The Children's Embedded Figures Test (CEFT) is a child's version of the EFT constructed for administration to ages five to twelve. It has been developed because the level of difficulty of the adult EFT has been proven to be too great for children below nine years of age. The CEFT involves a 25-item test which utilizes only two simple figures. An 11-item series with a "tent" figure and a 14-item series with a "house" figure comprise the total test.

Reliability coefficients for the CEFT for ages 7 through 12 were found to vary from .83 to .90 (Witkin et al., 1971). CEFT reliability for children in the five to six year age group was investigated by Dreyer, Nobelkopf, and Dreyer in 1969. Forty-six middle-class children from a suburb in the Hartford, Connecticut area were given the CEFT in a test-retest situation. Reliability after a five to six month interval was .87 (Dreyer et al., 1969).

Validity on the CEFT has been assessed by comparing the scores of nine and eleven year age groups on the EFT and the CEFT and by correlating CEFT and RFT scores (Witkin et al., 1971). Correlations

between the CEFT and the portable RFT for five year old boys and girls were found to be .61 and .66 respectively (Dreyer et al., 1971). Validity has also been measured by research utilizing criterion variables previously known to relate to EFT performance.

> If measures of these criterion variables are found to relate to CEFT performance in the same way as they proved in past studies to be related to EFT performance, supportative evidence for the validity of the CEFT at younger ages would be provided (Witkin et al., 1971, p. 28).

Investigations have found field dependence to be significantly correlated with measures of personality, social interaction, perception and cognition. Field independent subjects have been characterized as being less dependent on others, more resistant to social environment pressures, and less responsive to prior reinforcement (Mausner & Graham, 1970 & Witkin, 1959). Field independence has also been linked to superior analytical skill, a significant factor in some tests of intelligence (Wachtel, 1972). However, Busch and DeRidder (1971) and Busch and Simon (1972) found low and nonsignificant correlations between the Lorge-Thorndike Intelligence Test and RFT field dependence scores for groups of 70 and 48 kindergarten children.

Sex differences noted in field dependence studies reveal that women obtain higher field dependence scores (Fiebert, 1967 & Witkin, 1959). Low and nonsignificant differences have been reported when only kindergarten children were considered (Busch, 1970, Busch & Simon, 1972, Dreyer et al., 1971, & Goodenough & Eagle, 1963). In addition, age differences have been investigated. Field dependence has been found to decrease with age. "Children tend to be field dependent early in their perceptual development and to become field independent as they grow

up (Witkin, 1959, p. 51)." Busch and Simon (1972) found significant increases in RFT scores in the age ranges five to six and five to seven but no significant increase between the ages of six and seven. Though there are age differences, the child's field dependence rank within the population "tends to be established early in life, and to remain relatively stable (Witkin, 1959, p. 51).

Another area studied in relation to field dependence is the concept which Witkin terms body image. Witkin et al. (1971) posit that EFT studies show subjects with high levels of analytical ability or field independence tend to have differentiated body concepts. In a 1965 study Corah utilized 60 middle and upper middle class subjects between the ages of 8 and 11 in tests of figure drawing and perceptual articulation. High scores on Draw-a-Person Tests of body image and CEFT tests showed a tendency to be positively related for boys, .40, but not for girls, .02, (Corah, 1965). A reliable assessment of this relation has not been made nor has the interaction effect of body image boundary and field dependence been studied in relation to motor behavior.

Leithwood (1971), in studying 60 four year olds, found a significant correlation between complex motor ability and Banta's Early Childhood Embedded Figures Test (Banta, 1970). A Pearson product moment correlation coefficient of .25 was significant at the .05 level. A correlation of .12 between field dependence tests and simple motor ability scores was not significant. The findings suggest that field dependence may be of importance in motor activity, a logical interpretation when field dependence and motor activity are considered to be dimensions of an individual's total behavior organization. If this

is the case, some relationship between field dependence and the space utilization aspect of motor behavior might also be posited to exist.

CHAPTER III

PROCEDURES

This study involves an investigation of the relationships between locomotor space utilization, field dependence, and body image boundary. The procedures outlined in this chapter describe the methodology used to assess these relationships.

Selection of Subjects

Subjects for the study were selected from kindergarten children enrolled at The University of North Carolina at Greensboro Institute for Child and Family Development. Selection of subjects was based on the following criteria. First, each subject was approximately five years of age. Second, each subject was free from any known uncorrected visual defect. A third criterion was absence of any past history of psychological illness. In addition, each subject was free from recent serious illness or disease. Finally, each subject was free from gross physical handicaps. Only subjects meeting all criteria were utilized in the study.

Thirteen children from a 17 child kindergarten class were employed as subjects. The ages of the children ranged from 5.13 to 6.41 years with a mean age of 5.71 years. Two of the four kindergarten children not participating were withdrawn from the sample when speech defects prohibited adequate responses to body image boundary testing.

A third subject was ill during film trials, and a fourth refused to participate in CEFT procedures.

Measurement of Space Utilization

Space utilization was assessed through videocordings of children's play behavior. A Sony AVC-3200 Video Camera, Sony AVF-3200 Electronic Viewfinder, and Sony AV-3600 Videocorder equipped with ½ inch tape were used to photograph the playground and children. A trained assistant filmed the trials with a camera hidden from the view of the children in a third story window of an adjacent building. The exact location of the camera and tripod was marked to aid in filming replication which was done by the experimenter. In addition, a 2½ by 3 inch transparency which designated specific landmarks in the field of view was placed over the camera viewfinder to assure corresponding visual fields during each trial.

The space used in the study was an apparatus free area located within the kindergarten playground. The 576 square foot sector, measuring 24 feet by 24 feet, was surrounded by a string fence during filming trials.

Subjects were randomly assigned (by drawing names) to groups of five for each of the trials. Kindergarten children not contained in the sample were randomly selected to equate the number in each group. The subjects were filmed on five separate dates during an eight day period from May 3 to May 10, 1973. Prior to the initial trial the following instructions were given by the experimenter:

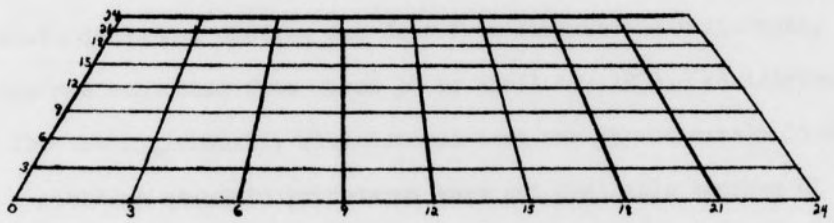
> This morning we are going to go outside and play using some special rules. Let's go outside and see what is on the playground.
>
> See the string fence. We are going to use it in our game. There are special rules for our game but they are very easy. There are three rules: (1) play inside the string fence, (2) stay inside the string fence but don't play with the string so it doesn't break, (3) play inside until I tell you it is time to go back inside the building. Do you think you can remember those rules? Are there any questions? Remember to stay inside the string fence until I tell you it is time to go back inside the building. Let's go play.

On subsequent trials the subjects were asked the following question: "Does everyone remember the rules for playing?" After repeating the rules with the help of the subjects, the experimenter assumed a position approximately 20 yards from the subjects and engaged in filling out form descriptions of each subject's attire to aid in later film identification.

Film analyses were completed for the 13 subjects on each of three trials. Analyses of all five trials were not possible due to filming errors not detected on spot checks and the intrusion of one parent during a filming session. Five subjects with totals of three analyses were included in the study by randomly selecting three trials from the film analyses of the other eight children.

A transparent grid containing a co-ordinate system was obtained by physically marking off the space in one square yard areas with $2\frac{1}{4}$ inch white tape (See Figure 1, p. 30). Nine minute film trials were conducted with the middle five minute sector of each trial being analyzed at 10 second intervals on a 22 inch Sony Monitor/Receiver. The 30 Cartesian co-ordinates which were derived were employed in a plotter

FIGURE 1



SCALED GRID FOR ASSESSING COORDINATES ON FILM ANALYSES OF LOCOMOTOR MOVEMENT

diagrams of subjects paths during each five minute period. Calculations of total square feet of space utilized were derived by measuring the areas enclosed within plots graphed on a 1 graph unit to .09 square foot scale. A computer program was employed to calculate the total linear distances traveled.

Measurement of Body Image Boundary

Body image boundary was assessed by Barrier scores on the first 25 inkblots of the Holtzman Inkblot Test, Form A. Each of the thirteen subjects was individually tested by the experimenter in a room provided by the kindergarten administrator. The room, which contained two small desks and chairs, was free from distracting influences. The testing was conducted from March 30 to April 19, 1973. Administration time for the individually administered test was approximately 35 minutes.

Although standard procedures were not available because of necessary verbal flexibility, recommended suggestions were employed (Holtzman et al., 1961). The following instructions were received by each subject.

> Today we are going to see some inkblot pictures. I'd like you to look at each inkblot and tell me what it might look like or what it could be. There are no wrong answers. Tell me what you first see and I will circle the area on the paper where you see the object. I'll ask you some questions because I want to see it just like you do. There are no wrong answers so make sure you tell me everything.

If the subject gave no response to an inkblot after sixty seconds the following statement was issued.

> Some inkblot pictures are more difficult than others. Remember there are no right or wrong answers. Do you want to look at the inkblot a little longer?

The completed protocols were number coded and sent to Dr. Seymour Fisher for blind scoring on Barrier response.

Measurement of Field Dependence

Field dependence was assessed from the Children's Embedded Figures Test (CEFT), Form 1. Administration procedures followed the guidelines established by Witkin et al. (1971) in the test manual available from Consulting Psychologist's Press, Inc. A two minute time limit was placed on each of the 25 scored test items. The total administraion time per subject was approximately 30 minutes. The testing was completed from April 9 to April 25, 1973. All testing employed the experimenter and surroundings used in the HIT administration. Responses were scored one or zero, one being credited when the child's first response was correct or an initial incorrect choice was immediately corrected. The number of items passed equalled the total score, the maximum attainable score was 25.

CHAPTER IV

DATA AND ANALYSIS

The data analyses in this chapter are the result of an investigation of the effects of body image boundary, field dependence, and sex on kindergarten children's utilization of space during locomotor activity. Nonparametric statistical techniques are employed to assess sex differences within variables and correlations between variables.

Variables Investigated

Three independent variables were identified in the present study: body image boundary, field dependence, and sex. Total linear distance traveled and total area utilized were designated as dependent variables. A summary of each subject's raw score and rank on all variables is shown in Table 1, page 34. Statistical analyses of the variables accept a two-tailed .10 level of significance.

Correlations Between Variables

Spearman Rank Order Correlation Coefficients were calculated to determine the relationship of field dependence with linear distance traveled and square feet of space used (Table 2, page 35). The correlation between field dependence and linear feet traversed during locomotor movement was .445. A correlation coefficient of .404 was found between the ranks on CEFT and total area utilized. Neither

TABLE 1

SUMMARY OF RAW SCORES AND RANKS FOR ALL SUBJECTS ON AGE, BARRIER, CEFT, LINEAR DISTANCE TRAVELED AND SQUARE FEET OF SPACE UTILIZED

Subject	Sex	Age*	Rk.	Barrier	Rk.	CEFT	Rk.	Linear Distance	Rk.	Square Feet	Rk.
01	F	5.53	9	3	10½	6	13	1293	10	246	10
02	F	5.37	10	5	7	8	9½	807	12	113	12
03	F	6.18	2	13	1	15	1	1802	4	436	9
04	F	6.41	1	2	12½	12	5	771	13	43	13
05	F	5.16	12	10	3	10	7	1994	1	607	6
06	F	5.96	4	7	5	7	11½	1303	11	152	11
07	M	5.90	6	7	5	7	11½	1451	9	573	8
08	M	5.84	8	3	10½	10	7	1624	8	583	7
09	M	6.15	3	4	8½	13	3	1874	3	999	1
10	M	5.87	11	11	2	13	3	1761	6	697	5
11	M	5.94	5	7	5	8	9½	1799	5	917	3
12	M	5.13	13	4	8½	10	7	1891	2	899	4
13	M	5.18	11	2	12½	13	3	1649	7	931	2

*Calculated from April 1, 1973

TABLE 2

SPEARMAN RANK ORDER CORRELATION COEFFICIENTS
FOR CORRELATIONS BETWEEN BARRIER, CEFT,
LINEAR DISTANCE AND TOTAL AREA

Variables	Correlation Coefficient
CEFT and Linear Distance	.445*
CEFT and Total Area	.404*
Barrier and Linear Distance	.408*
Barrier and Total Area	.023
Barrier and CEFT	.106

*$.10 < p < .20$ with 11 degrees of freedom

coefficient reached the accepted .10 level of significance.

A positive relationship of .408 was derived from ranked scores on body image boundary Barrier and linear space utilization. A slight positive relationship of .023 existed between Barrier scores and total square feet of space used during locomotor activity. The correlation coefficients were not large enough to reach significance(Table 2, page 35).

A fifth correlation was calculated from ranked scores on body image boundary Barrier and field dependence. A coefficient of .106 indicated no significant relationship between field dependence and body image boundary (Table 2, page 35).

Significance of the Differences Between Correlation Coefficients

Olkin's z was employed to ascertain the significance of the differences between the predictor variables of body image boundary and field dependence with linear and square feet predictands (Hendrickson & Stanley, 1970). A z of 1.338 was yielded when a comparison of the .408 and .445 correlations of Barrier and CEFT with linear distance traveled was made. The z approached the .20 level of significance, a 1.37. The difference between the .023 and .404 correlations of Barrier and CEFT with square feet of area gave a z of 1.076. The significance of the z fell between the .20 and .40 levels. No significant differences at the .10 level were found between the predictor variables with either predictand.

Sex Differences

Sex differences on measures of body image boundary, field

dependence, linear feet traversed, and square feet of space used were assessed using the Mann-Whitney U Test. Table 3 on page 38 summarizes the findings for sex differences on field dependence and body image boundary. The mean Barrier score for the entire group was 6.00. Female subjects had a slightly higher mean score than male subjects, a 6.67 as compared to a 5.43. The Mann-Whitney U of 18 yielded a nonsignificant probability of .703.

The male field dependence score mean of 10.57 exceeded both the group mean of 10.15 and the female mean of 9.67. Sex difference calculations gave a U of 16 with a nonsignificant probability of .534.

Mean linear distance scores for the entire group and both sexes are shown in Table 4 on page 39. The group averaged 1519.52 linear feet of travel during the total 15 minutes of film analysis. The male mean of 1721.31 exceeded the 1284.11 female mean. The sex difference, as calculated from a Mann-Whitney U of 12, had a .234 probability which was slightly greater than the acceptable .10 level of significance.

Table 5 on page 40 shows the mean total area utilized by the entire group and each sex. The group averaged 522.77 square feet of space used during the total 15 minutes of film analysis. The male mean of 779.86 greatly exceeded the female mean of 199.50. A Mann-Whitney U of 2 was associated with a significant probability of .004.

A summary of the Mann-Whitney U Test results finds one probability level slightly greater than the accepted .10 level, the .234 probability associated with total linear feet traversed. One significant sex difference was found, the .004 probability between sexes on total area used.

TABLE 3

SUMMARY OF AGE, BARRIER SCORES, AND CEFT SCORES

Measure	Group N=13	Boys N=7	Girls N=6	Mann-Whitney U	Prob.
Age:					
High	6.41	6.15	6.41		
Low	5.13	5.13	5.16		
$\bar{X}$	5.74	5.71	5.75		
Barrier Score:					
High	13.00	11.00	13.00		
Low	2.00	2.00	2.00		
$\bar{X}$	6.00	5.43	6.67	18	.730
S.D.	3.42	2.87	3.86		
CEFT Score:					
High	15.00	13.00	15.00		
Low	6.00	7.00	6.00		
$\bar{X}$	10.15	10.57	9.67	16	.534
S.D.	2.74	2.32	3.09		

TABLE 4

SUMMARY OF TOTAL DISTANCES TRAVELED
IN LINEAR FEET

Measure	Group N=13	Boys N=7	Girls N=6	Mann-Whitney U	Prob.
Total Linear Distance:					
High	1994.30	1891.41	1994.30		
Low	771.26	1450.53	771.26		
				12	.234
$\bar{X}$	1519.52	1721.31	1284.11		
Per Trial $\bar{X}$	506.51	573.77	428.04		

TABLE 5

SUMMARY OF TOTAL SPACE UTILIZED
IN SQUARE FEET

Measure	Group N=13	Boys N=7	Girls N=6	Mann-Whitney U	Prob.
Total Square Feet:					
High	999	999	607		
Low	43	583	43		
$\bar{X}$	522.77	799.86	199.50	2	.004*
Per Trial $\bar{X}$	184.51	266.62	66.50		

*Significant sex difference

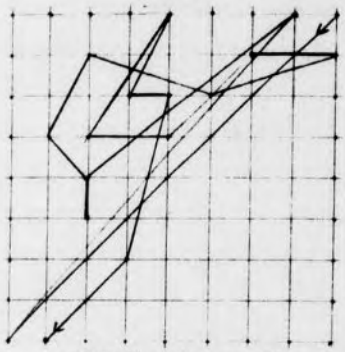
Characterization of Subjects' Uses of Space

A characterization of each subject's utilization of space is presented on pages 42 through 54. Plots derived from each of the five minute film analyses are shown for each subject. Linear and square feet totals represented by each plot are also given. In addition, the experimenter presents written analyses of each subject's space utilization.

The analyses are based on the plots of each subject's locomotor movement and the Cartesian co-ordinates from which the plots are generated. Only the Cartesian co-ordinates are employed to assess stationary behavior.

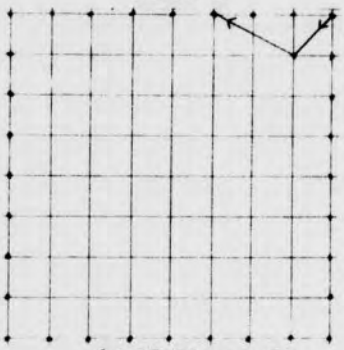
Subject 01: Characterization of Space Utilized

Trial 1



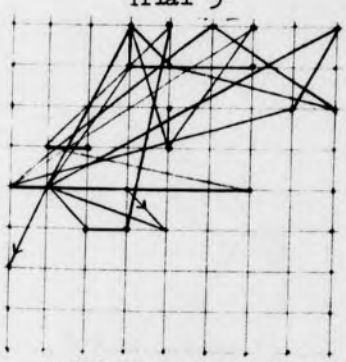
577.84 linear ft.
89.00 square ft.

Trial 2



67.08 linear ft.
0.00 square ft.

Trial 3



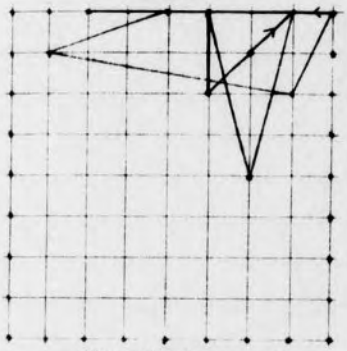
648.31 linear ft.
157.00 square ft.

TOTALS	RANK
1293.23 linear ft.	10
246.00 square ft.	10

Subject 01 was a female subject 5.53 years of age. The subject did not show great consistency among trials on either linear or square feet of space utilized. She tended to remain stationary for long periods of time and to concentrate her activity in the central portions of the enclosure.

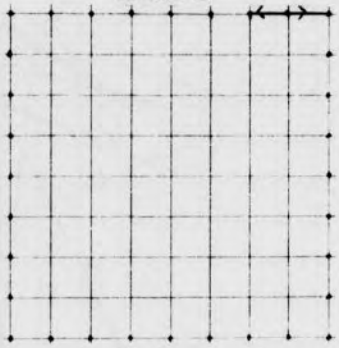
Subject 02: Characterization of Space Utilized

Trial 1



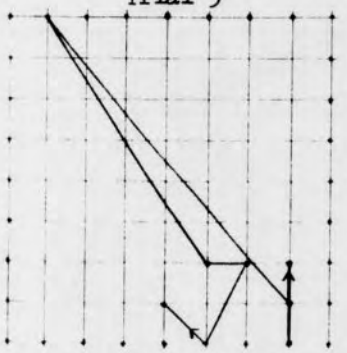
385.36 linear ft.
83.00 square ft.

Trial 2



51.96 linear ft.
0.00 square ft.

Trial 3



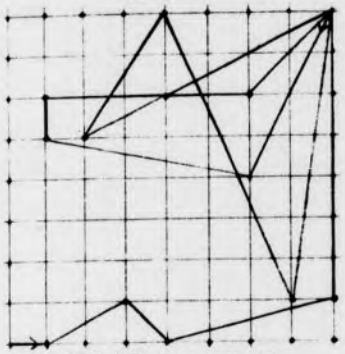
369.86 linear ft.
30.00 square ft.

TOTALS	RANK
807.18 linear ft.	12
113.00 square ft.	12

Subject 02 was a female subject 5.37 years of age. The subject did not show great consistency among trials on either linear or square feet of space utilized. She remained stationary for long periods of time and often visited the periphery of the enclosure.

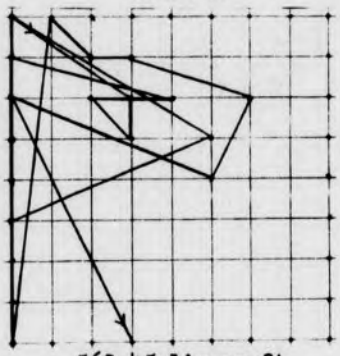
Subject 03: Characterization of Space Utilized

Trial 1



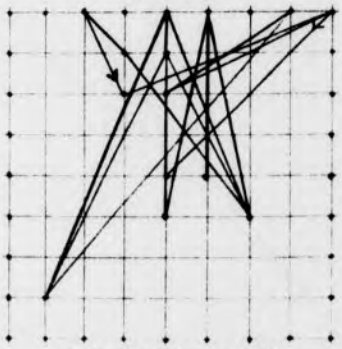
520.48 linear ft.
173.00 square ft.

Trial 2



560.45 linear ft.
151.00 square ft.

Trial 3



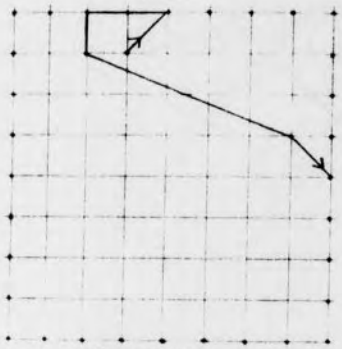
720.62 linear ft.
112.00 square ft.

TOTALS	RANK
1801.55 linear ft.	4
436.00 square ft.	9

Subject 03 was a female subject 6.18 years of age. The film analyses of the subject's movement showed that she remained stationary for thirty seconds to one minute between location changes but was an active traveler when her location shifted. She used only specific portions of the enclosure on each trial but utilized both the periphery and the central area.

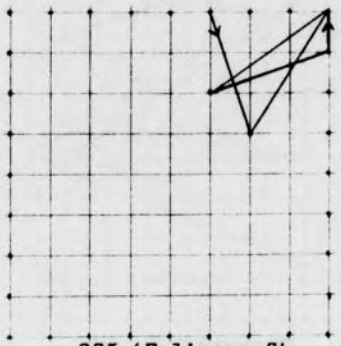
Subject 04: Characterization of Space Utilized

Trial 1



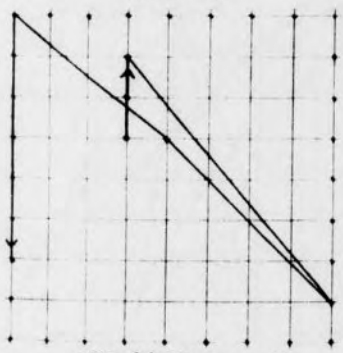
184.93 linear ft.
0.00 square ft.

Trial 2



205.67 linear ft.
21.00 square ft.

Trial 3



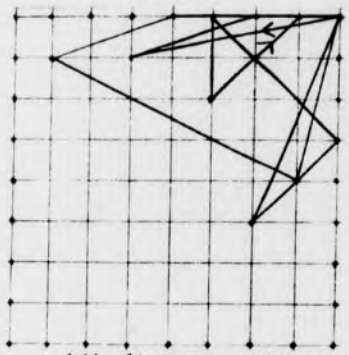
380.66 linear ft.
22.00 square ft.

TOTALS	RANK
771.26 linear ft.	13
43.00 square ft.	13

Subject 04 was a female subject 6.41 years of age. The subject consistently used little of the available space. She remained at each location for periods up to several minutes in length. The subject traveled to and from locations on the periphery of the enclosure.

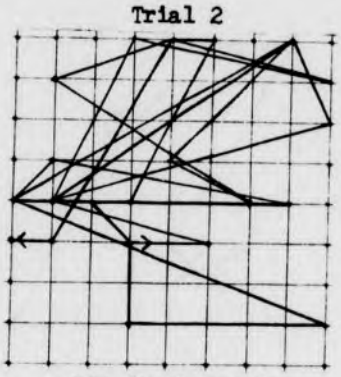
Subject 05: Characterization of Space Utilized

Trial 1



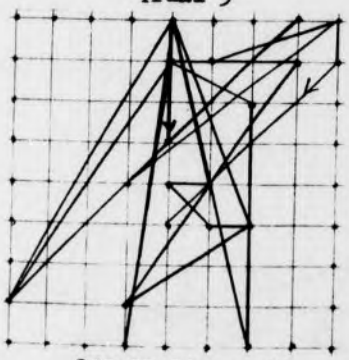
414.61 linear ft.
150.00 square ft.

Trial 2



720.62 linear ft.
238.00 square ft.

Trial 3



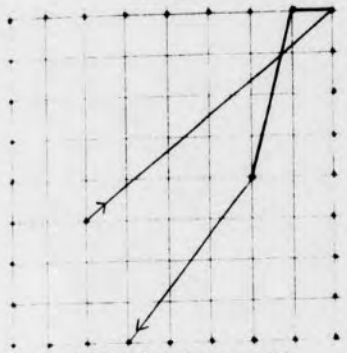
859.07 linear ft.
219.00 square ft.

TOTALS	RANK
1994.30 linear ft.	1
607.00 square ft.	6

Subject 05 was a female subject 5.16 years of age. Trials two and three showed similarities in both linear feet and square feet of space utilized. During the last two trials the subject was highly active and seldom remained at specific locations for more than the ten second film analysis interval. Trial 1 was not consistent with the latter trials. The subject was stationary for long periods during the initial trial.

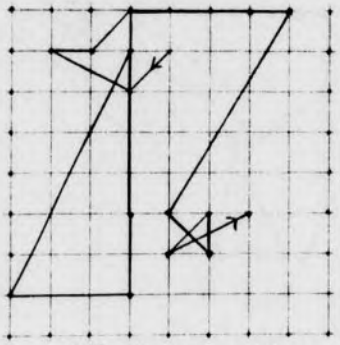
Subject 06: Characterization of Space Utilized

Trial 1



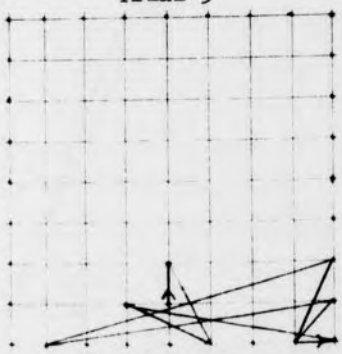
305.94 linear ft.
5.00 square ft.

Trial 2



364.97 linear ft.
96.00 square ft.

Trial 3



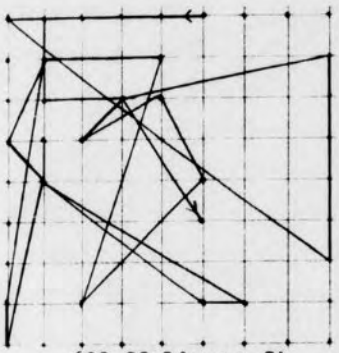
366.20 linear ft.
51.00 square ft.

TOTALS	RANK
1303.10 linear ft.	11
152.00 square ft.	11

Subject 06 was a female subject 5.96 years of age. The subject consistently utilized little of the available space in the enclosure. Both her linear distance and total area scores were low in relation to the other subjects tested. All three trials showed long periods of stationary play activity.

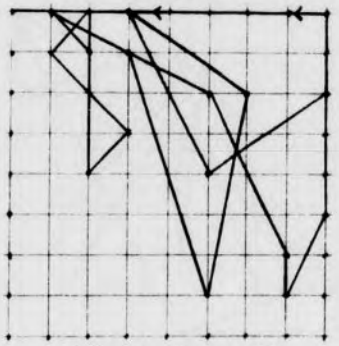
Subject 07: Characterization of Space Utilized

Trial 1



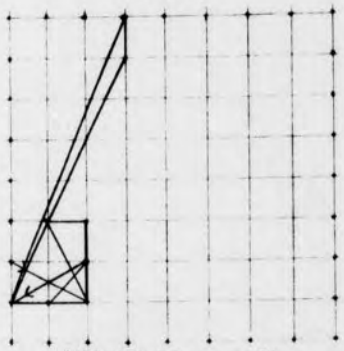
600.00 linear ft.
267.00 square ft.

Trial 2



361.25 linear ft.
54.00 square ft.

Trial 3



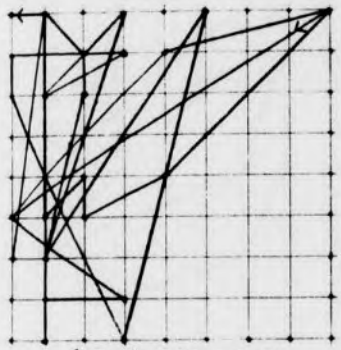
489.29 linear ft.
252.00 square ft.

TOTALS	RANK
1450.53 linear ft.	9
573.00 square ft.	8

Subject 07 was a male subject 5.90 years of age. The subject showed consistency in space utilization on trials one and three but not on trial two. Trial two was characterized by long periods without location changes.

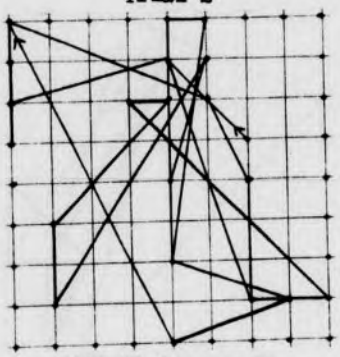
Subject 08: Characterization of Space Utilized

Trial 1



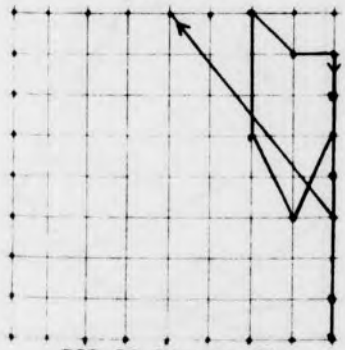
627.14 linear ft.
268.00 square ft.

Trial 2



289.31 linear ft.
259.00 square ft.

Trial 3



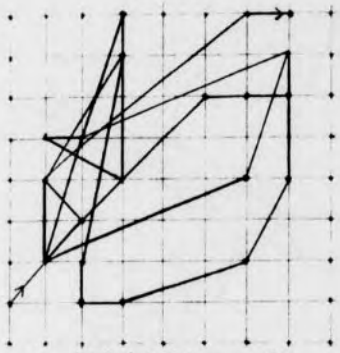
707.39 linear ft.
56.00 square ft.

TOTALS	RANK
1623.84 linear ft.	8
583.00 square ft.	7

Subject 08 was a male subject 5.84 years of age. The subject showed some consistency on total area utilized during trials one and two. Trial three was marked by changes of location along the periphery of the enclosure and little exploration of the total space available. The results on trials one and two did not indicate a preference for either the periphery or central portion of the enclosure.

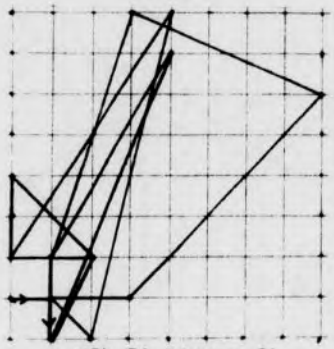
Subject 09: Characterization of Space Utilized

Trial 1



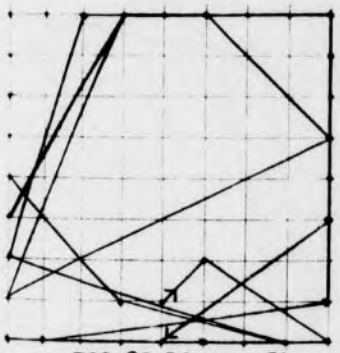
498.40 linear ft.
229.00 square ft.

Trial 2



584.81 linear ft.
247.00 square ft.

Trial 3



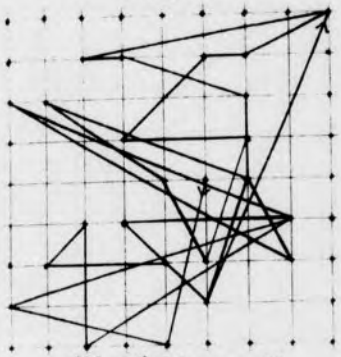
790.89 linear ft.
523.00 square ft.

TOTALS	RANK
1874.09 linear ft.	3
999.00 square ft.	1

Subject 09 was a male subject 6.15 years of age. The subject was very active during all three trials. His utilization of space was extensive on trial three. Trials two and three were characterized by repeated visits to the periphery of the enclosure. Trial three showed a greater concentration of space utilization in the central portion of the available space.

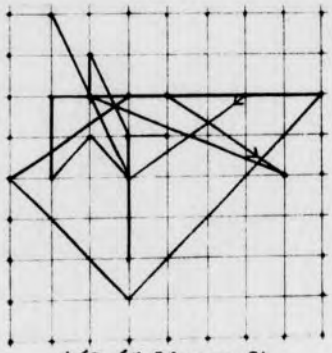
Subject 10: Characterization of Space Utilized

Trial 1



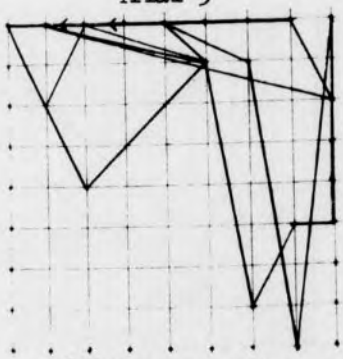
684.76 linear ft.
261.00 square ft.

Trial 2



467.65 linear ft.
195.00 square ft.

Trial 3



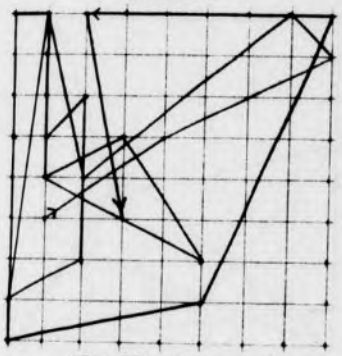
608.93 linear ft.
241.00 square ft.

TOTALS	RANK
1761.35 linear ft.	6
697.00 square ft.	5

Subject 10 was a male subject 5.87 years of age. The subject showed consistency on both measures of space utilization on trials one and three. Trial two was characterized by fewer changes of location. Trials one and two showed a concentration of activity in the central portion of the space. Trial three showed a preference for the periphery of the enclosure.

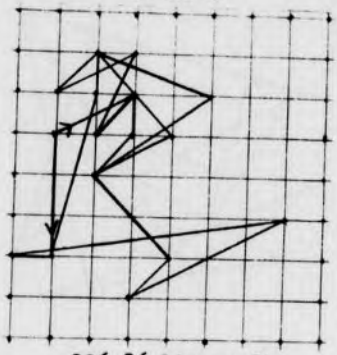
Subject 11: Characterization of Space Utilized

Trial 1



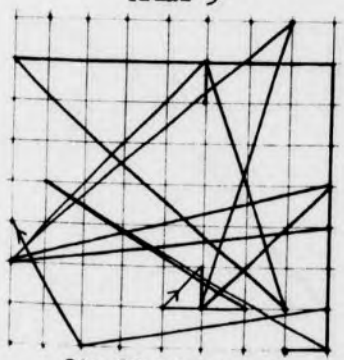
587.88 linear ft.
406.00 square ft.

Trial 2



396.86 linear ft.
109.00 square ft.

Trial 3



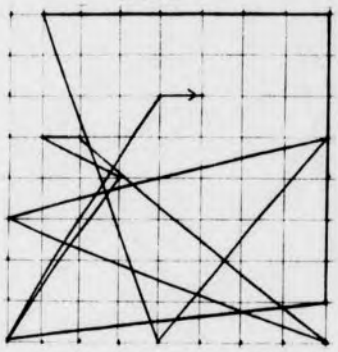
813.88 linear ft.
402.00 square ft.

T TOTALS	RANK
1798.62 linear ft.	5
917.00 square ft.	3

Subject 11 was a male subject 5.94 years of age. The subject showed a consistent concentration on both the central portion and periphery of the space on trials one and three. The results on trial two indicated a preference for the center of the enclosure. The subject was active during all three trials and seldom remained stationary for long periods.

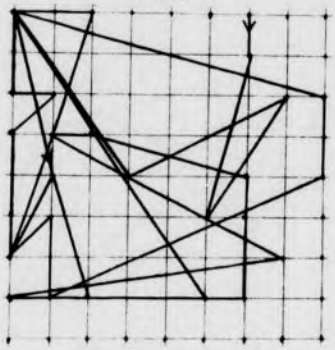
Subject 12: Characterization of Space Utilized

Trial 1



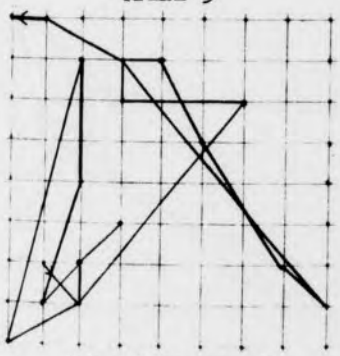
711.83 linear ft.
449.00 square ft.

Trial 2



725.60 linear ft.
376.00 square ft.

Trial 3



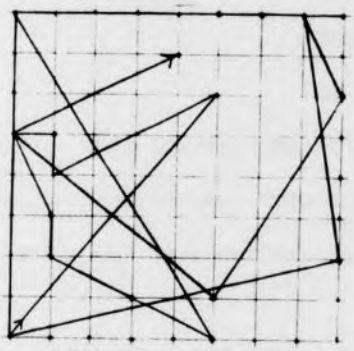
453.98 linear ft.
74.00 square ft.

TOTALS	RANK
1891.41 linear ft.	2
899.00 square ft.	4

Subject 12 was a male subject 5.13 years of age. The subject was extremely active during trial two but less active during trials one and three. Both the first and third trials showed periods of inactivity between changes in location. Trials one and two showed a more extensive utilization of space than trial three.

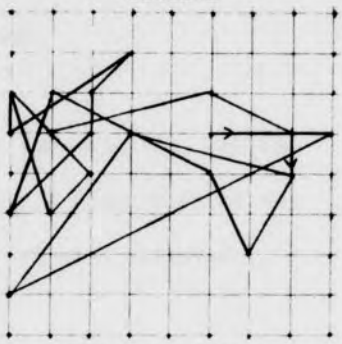
Subject 13: Characterization of Space Utilized

Trial 1



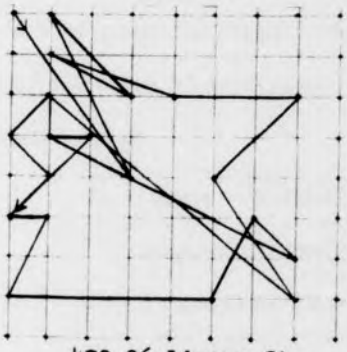
697.78 linear ft.
491.00 square ft.

Trial 2



472.44 linear ft.
187.00 square ft.

Trial 3



479.06 linear ft.
253.00 square ft.

TOTALS	RANK
1649.28 linear ft.	7
931.00 square ft.	2

Subject 13 was a male subject 5.18 years of age. The subject showed some consistency of space utilization on trials two and three. He was inactive between changes of location and utilized the central portion of the enclosure on both trials. Trial one showed a greater concentration of movement along the periphery of the space and less preference for the central portion.

CHAPTER V

SUMMARY AND CONCLUSIONS

This chapter presents a summary of the investigation and the conclusions derived from the analysis of data. A discussion of the results and implications for future research are also included.

Summary

The study investigated the relationships between body image boundary, field dependence, linear feet traversed, and total square feet of area utilized. In addition, scores on the four measures were analyzed for significant sex differences. The following hypotheses were tested.

1. Space utilization measurements of the five year old child engaged in self-structured locomotor movement are positively related to measures of field dependence-independence.

2. Space utilization measurements of the five year old child engaged in self-structured locomotor movement are positively related to measures of body image boundary.

3. High body image boundary Barrier scores of the five year old child are positively related to measures of high field independence.

4. Significant sex differences are found in five year old children on measures of body image boundary, field dependence, linear feet of space used during locomotor activity, and square feet of space used during locomotor activity.

A written analysis of each subject's utilization of space was also presented.

Individually administered Holtzman Inkblot Tests and Children's Embedded Figures Tests were given to assess body image boundary and field dependence. A videocorder was employed to tape three five minute periods of play activity for analyses of each subject's utilization of space.

Conclusions

Spearman Rank Order Correlation Coefficients were calculated to test hypotheses one, two, and three. Correlations of .445 and .404 were found between field dependence scores with linear feet and square feet space utilization measures. The correlations failed to reach the .10 level of significance. Space utilization measures were not found to have a significant positive relationship to measures of children's field dependence and, therefore, the first hypothesis was rejected.

Correlations of .408 and .023 were calculated between Barrier scores with linear feet and square feet space utilization results. Neither correlation was significant at the .10 level of significance. The correlations did not confirm the second hypothesis. No positive relationship was found between space utilization and body image

boundary beyond that accepted as chance correlation.

A correlation coefficient of .106 was found in testing the third hypothesis. The hypothesized positive relationship between high Barrier scores and high field independence was rejected.

Olkin's z was calculated to examine the significance of the differences between body image boundary and field dependence predictor variables with linear and square feet predictands. No significant differences were found.

The Mann-Whitney U Test was used to test hypothesis four and the expected sex differences on Barrier, CEFT, linear feet, and square feet measures. One significant sex difference was found at the .10 significance level. Male subjects utilized more square feet of space.

Discussion

The results of the investigation add to the limited store of information regarding the variables affecting the child's use of space during locomotor activity. All findings are in general agreement with past research studies. Female subjects tend to have higher Barrier scores and to be more field dependent although the differences between males and females are not significant at the .10 level. The use of multiple measures of body image boundary and field dependence may provide a clearer representation of the actual situation.

The study indicated that boys utilize considerably more space than girls at the kindergarten level. This finding agrees with the findings of Mulhauser (1970). Only the total area scores are

significant, however. The results of the linear distance scores suggest that an actual difference may exist which is not indicated due to the limited number of subjects in the present investigation.

Methodological Implications

The filming and film analysis procedures devised for the study are adequate but tedious. The incorporation of a computerized procedure for film analysis could make the exploration of space utilization a more productive research area. The time involvement is prohibitive at the present time. Obtaining analyses on sufficient numbers of subjects is extremely difficult.

Use of a fish-eye lens, as suggested by the filming procedures employed by Herron and Frobish (1969), is recommended to allow a broader field of view and to eliminate the necessity of a high filming location.

A group administration of Holtzman Inkblot Test slides has been successfully used in research studies (Lampen, 1972). Similar procedures could save considerable amounts of testing time.

Research Implications

The findings of this study are pertinent to several areas of inquiry. One of the most obvious implications is the need for a longtitudinal study of the possible sex differences in children's space utilization. A second implication is the study of societal and inherent variance as possible explanations for the sex differences found in the present investigation.

Continued exploration of the effects of body image boundary and field dependence on space utilization is also warranted from the positive but nonsignificant correlations found in the investigation. The greater predictability of probable correlations, combined with larger numbers of subjects should allow more powerful statistical analyses of future data.

In addition, the methodology employed to assess space utilization can be combined with additional perceptual and personality variables. The research will provide a clearer picture of the complex interaction of variables affecting the child's use of space during locomotor activity.

Playgrounds of various sizes and shapes may be used to test possible differences in children's activity levels. With the greater understanding may come more efficient and purposeful designs for playgrounds and indoor play spaces.

BIBLIOGRAPHY

BIBLIOGRAPHY

Ahrens, S. J. Spatial dimensions of movement. Unpublished Master's thesis, U.C.L.A., 1966. Cited by B. J. Cratty, Movement behavior and motor learning. Philadelphia: Lea and Febiger, 1968.

Allport, F. H. Theories of perception and the concept of structure. New York: John Wiley and Sons, 1955.

Banta, T. J. "Tests for the evaluation of early childhood education." In J. Hellmuth (Ed.), Cognitive studies. New York: Bruner-Mazel, 1970.

Busch, J. C. Conformity in preschool disadvantaged children as related to field dependence, sex and verbal reinforcement. (Doctoral dissertation, University of Tennessee) Ann Arbor, Michigan: University Microfilms, 1971, No. 71-334.

Busch, J. C. & DeRidder, L. M. Note on control for intelligence in studies of field dependence with young children, Perceptual and Motor Skills, 1971, 32, 337-338.

Busch, J. C. & Simon, L. H. Methodological variables in the study of field dependent behavior of young children. Paper presented at the American Educational Research Association meeting, Chicago, April, 1972.

Cleveland, S. E., Snyder, R., & Williams, R. L. Body image and site of psychosomatic symptoms. Psychological Reports, 1965, 16, 851-852.

Corah, N. L. Differentiation in children and their parents. Journal of Personality, 1965, 33, 300-308.

Cratty, B. J. Movement behavior and motor learning. Philadelphia: Lea and Febiger, 1968.

Davis, A. D. Some physiological correlates of Rorschach body image productions. Journal of Abnormal and Social Psychology, 1960, 60, 432-436.

Dreyer, A. S., Nebelkopf, E., & Dreyer, C. A. Note concerning stability of cognitive style measures in young children. Perceptual and Motor Skills, 1969, 28, 933-934.

Espenchade, A. S. & Eckert, H. M. Motor development. Columbus, Ohio: Merrill Publishing Company, 1967.

Fiebert, M. Cognitive styles in the deaf. Perceptual and Motor Skills, 1967, 24, 319-329.

Fisher, R. L. Body boundary and achievement behavior. Journal of Projective Techniques, 1966, 30, 435-438.

Fisher, R. L. Failure of the conceptual styles test to discriminate normal and highly impulsive children. Journal of Abnormal Psychology, 1966a, 71, 429-431.

Fisher, S. Body image boundaries in the aged. The Journal of Psychology. 1959, 48, 315-318.

Fisher, S. A further appraisal of the body boundary concept. Journal of Consulting Psychology, 1963, 27, 162-174.

Fisher, S. Body experience in fantasy and behavior. New York: Appleton-Century-Crofts, 1970.

Fisher, S. & Cleveland, S. E. Body image and personality. Princeton, New Jersey: D. Van Nostrand Co., 1958.

Fisher, S. & Cleveland, S. E. A comparison of psychological characteristics and physiological reactivity in ulcer and rheumatoid arthritic groups - II. Difference in physiologic reactivity. Journal of Psychosomatic Medicine, 1960, 22, 290-293.

Fisher, S. & Renik, O. D. Induction of body image boundary changes. Journal of Projective Techniques, 1966, 30, 429-434.

Goodenough, D. R. & Eagle, C. A modification of the embedded-figures test for use with young children. Journal of Genetic Psychology, 1963, 103, 67-74.

Hartley, R. B. A homonym word association measure of the barrier variable and its comparison with the inkblot barrier measure. Unpublished doctoral dissertation, University of Washington, 1964. Cited in S. Fisher, Body experience in fantasy and behavior. New York: Appleton-Century-Crofts, 1970.

Hawkins, D. B. & Horowitz, H. Variations in body image as a function of achievement level in school performance. Perceptual and Motor Skills, 1971, 33, 1299-1302.

Hendrickson, G. F., Stanely, J. C., & Hills, J. R. Olkin's new formula for significance of r_{13} vs r_{23} compared with Hotelling's method. American Educational Research Journal, 1970, 7, 189-195.

Herron, R. E. & Frobish, M. J. Computer analysis and display of movement patterns. Journal of Experimental Child Psychology, 1969, 8, 40-44.

Hochberg, J. E. Perception. Englewood Cliffs, New Jersey: Prentice Hall Incorporated, 1964.

Holtzman, W. J., Thorpe, J. S., Swartz, J. D., & Herron, E. W. Inkblot Perception and Personality. Austin, TexasL University of Texas Press, 1961.

Jacobson, G. R. Effect of brief sensory deprivation on field dependence. Journal of Abnormal Psychology, 1966, 71, 115-118.

Lampen, L. J. The effects of selected perceptual motor experiences on body image boundary and acceleration of conservation. Unpublished Master's thesis, Sam Houston State University, 1972.

Leithwood, K. A. Motor, cognitive, and affective relationships among advantaged preschool children. Research Quarterly, 1971, 42, 47-53.

McFee, W. D. The relationships between body image boundaries, estimates of dimensions of body space, and performance of selected gross motor tasks in late adolescent subjects. (Doctoral dissertation, Ohio State University) Ann Arbor, Michigan: University Microfilms, 1968, No. 68-15,358.

McFee, W. D. The relationships between body image boundary, body spatial image, and movement performance in early adolescent subjects. Paper presented at the meeting of the American Association of Health, Physical Education and Recreation National Convention, Detroit, Michigan, April, 1971.

Magargee, E. I. Relation between barrier scores and aggressive behavior. Journal of Abnormal Psychology, 1965, 70, 307-311.

Mausner, B. & Graham, J. Field dependence and prior reinforcement as determinants of social interaction in judgment. Journal of Personality and Social Psychology, 1970, 16, 486-493.

Morton, J. D. The relationship between inkblot barrier scores and sociometric status in adolescents. Unpublished master's thesis, University of British Columbia, 1965. Cited in S. Fisher. Body experience in fantasy and behavior. New York: Appleton-Century-Crofts, 1970.

Mulhauser, F. A. An exploratory study of relationships of space utilization with selected dimensions of behavior in children age 5. Research Quarterly, 1972, 43, 47-54.

Piaget, J. & Inhelder, B. The child's conception of space. New York: W. W. Norton and Company, 1948.

Shipman, Wm. G. Personality triaits associated with body-image boundary concern. Proceedings of the 73rd annual convention of the American Psycholgoical Association, 1965, 271-272.

Shultz, L. E. Relationships between body image and physical performance in adolescent girls. Unpublished Master's thesis, University of Maryland, 1961.

Siegel, S. Nonparametric statistics. New YorkL McGraw-Hill Book Company, 1956.

Swartz, J. D. & Witzke, D. B. Normative item statistics for the group form of the Holtzman inkblot technique. Perceptual and Motor Skills, 1970, 31, 319-329.

Wachtel, P. L. Field dependence and psychological differentiation: Reexamination. Perceptual and Motor Skills, 1972, 35, 179-189.

Webster's new world dictionary. New York: The World Publishing Company, 1959.

Witkin, H. A. The perception of the upright. Scientific American, 1959, 200, 26 &50-61.

Witkin, H. A., Oltman, P. K., Raskin, E., & Karp, S. A. A manual for the embedded figures test. Palo Alto, California: Consulting Psychologists Press, Incorporated, 1971.

Woods, M. D. An exploration of developmental relationships between children's body image boundaries, estimates of dimensions of body space, and performance of selected gross motor tasks. Unpublished Doctoral dissertation, Ohio State University, 1966.